

CLAIMS

What is claimed is:

1. A method of controlling frequency in a mobile communication device, the method comprising:

5 estimating a frequency error for the mobile communication device;

calculating a total timing drift for the mobile communication device using the estimated frequency error;

determining whether a magnitude of the estimated frequency error is greater than a predefined error threshold;

10 determining whether a magnitude of the total timing drift is greater than a predefined drift threshold if the magnitude of the estimated frequency error is determined to be not greater than the predefined error threshold; and

15 adjusting the frequency of the mobile communication device to reverse a direction of the total timing drift if the magnitude of the total timing drift is determined to be greater than the predefined drift threshold.

2. The method according to claim 1, further comprising keeping the frequency of the mobile communication device the same if the magnitude of the total timing drift is determined to be not greater than the predefined drift threshold.

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3. The method according to claim 1, wherein the adjusting step includes decreasing a reference frequency of the mobile communication device if a value of the total timing drift is determined to be not greater than the predefined drift threshold.

5 4. The method according to claim 1, wherein the adjusting step includes increasing a reference frequency of the mobile communication device if a value of the total timing drift is determined to be greater than the predefined drift threshold.

10 5. The method according to claim 1, further comprising changing the frequency of the mobile communication device if the magnitude of the estimated frequency error is determined to be greater than the predefined error threshold.

15 6. The method according to claim 5, wherein the step of changing includes decreasing a reference frequency of the mobile communication device if a value of the estimated frequency error is determined to be not greater than the predefined error threshold.

20 7. The method according to claim 5, wherein the step of changing includes increasing a reference frequency of the mobile communication device if a value of the estimated frequency error is determined to be greater than the predefined error threshold.

8. The method according to claim 1, wherein the step of adjusting includes decrementing or incrementing a voltage controlled oscillator by one resolution unit at a time.

9. The method according to claim 5, wherein the step of changing includes decrementing or incrementing a voltage controlled oscillator by one resolution unit at a time.

- 5 10. A mobile communication device, comprising:
- a transceiver unit;
- a voltage controlled oscillator adapted to generate a reference frequency signal for the transceiver unit; and
- a frequency control unit adapted to control the reference frequency generated by the
- 10 voltage controlled oscillator, the frequency control unit configured to:
- estimate a frequency error for the mobile communication device;
- calculate a total timing drift for the mobile communication device using the estimated frequency error;
- determine whether a magnitude of the estimated frequency error is greater
- 15 than a predefined error threshold;
- determine whether a magnitude of the total timing drift is greater than a predefined drift threshold if the magnitude of the estimated frequency error is determined to be not greater than the predefined error threshold; and
- adjust the frequency of the mobile communication device to reverse a
- 20 direction of the total timing drift if the magnitude of the total timing drift is determined to be greater than the predefined drift threshold.

11. The mobile communication device according to claim 10, wherein the frequency control unit is further configured to keep the frequency of the mobile communication device the same if the magnitude of the total timing drift is determined to be not greater than the predefined drift threshold.

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12. The mobile communication device according to claim 10, wherein the frequency control unit adjusts the frequency of the mobile communication device by decreasing the reference frequency if a value of the total timing drift is determined to be not greater than the predefined drift threshold.

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13. The mobile communication device according to claim 10, wherein the frequency control unit adjusts the frequency of the mobile communication device by increasing the reference frequency if a value of the total timing drift is determined to be greater than the predefined drift threshold.

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14. The mobile communication device according to claim 10, wherein the frequency control unit is further configured to change the frequency of the mobile communication device if the magnitude of the estimated frequency error is determined to be greater than the predefined error threshold.

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15. The mobile communication device according to claim 14, wherein the frequency control unit changes the frequency of the mobile communication device by

decreasing the reference frequency if a value of the estimated frequency error is determined to be not greater than the predefined error threshold.

16. The mobile communication device according to claim 14, wherein the
5 frequency control unit changes the frequency of the mobile communication device by increasing the reference frequency if a value of the estimated frequency error is determined to be greater than the predefined error threshold.

17. The mobile communication device according to claim 10, wherein the
10 frequency control unit adjusts the frequency of the mobile communication device by decrementing or incrementing a voltage controlled oscillator by one resolution unit at a time.

18. The mobile communication device according to claim 14, wherein the
frequency control unit adjusts the frequency of the mobile communication device by
15 decrementing or incrementing a voltage controlled oscillator by one resolution unit at a time.

19. A method of controlling frequency in a mobile communication device, the
method comprising:

estimating a long-term frequency error and a short-term frequency error for the
20 mobile communication device;

calculating a total timing drift for the mobile communication device using the
long-term frequency error;

determining whether a magnitude of the short-term frequency error is greater than a predefined error threshold;

determining whether a magnitude of the total timing drift is greater than a predefined drift threshold if the magnitude of the short-term frequency error is determined to be not greater than the predefined error threshold; and

adjusting the frequency of the mobile communication device to reverse a drift direction of the total timing drift if the magnitude of the total timing drift is determined to be greater than the predefined drift threshold.

10 20. The method according to claim 19, further comprising keeping the frequency
of the mobile communication device the same if the magnitude of the total timing drift is
determined to be not greater than the predefined drift threshold.

21. The method according to claim 19, wherein the adjusting step includes
15 decreasing a reference frequency of the mobile communication device if a value of the total
timing drift is determined to be not greater than the predefined drift threshold.

22. The method according to claim 19, wherein the adjusting step includes
increasing a reference frequency of the mobile communication device if a value of the total
20 timing drift is determined to be greater than the predefined drift threshold.

23. The method according to claim 19, further comprising changing the frequency of the mobile communication device if the magnitude of the short-term frequency error is determined to be greater than the predefined error threshold.

5 24. The method according to claim 23, wherein the step of changing includes decreasing a reference frequency of the mobile communication device if a value of the short-term frequency error is determined to be not greater than the predefined error threshold.

10 25. The method according to claim 23, wherein the step of changing includes increasing a reference frequency of the mobile communication device if a value of the short-term frequency error is determined to be greater than the predefined error threshold.

15 26. The method according to claim 19, wherein the step of adjusting includes decrementing or incrementing a voltage controlled oscillator by one resolution unit at a time.

27. The method according to claim 23, wherein the step of changing includes decrementing or incrementing a voltage controlled oscillator by one resolution unit at a time.

20 28. A mobile communication device, comprising:
a transceiver unit;
a voltage controlled oscillator adapted to generate a reference frequency signal for the transceiver unit; and

a frequency control unit adapted to control the reference frequency generated by the voltage controlled oscillator, the frequency control unit configured to:

estimate a long-term frequency error and a short-term frequency error for the mobile communication device;

5 calculate a total timing drift for the mobile communication device using the long-term frequency error;

determine whether a magnitude of the short-term frequency error is greater than a predefined error threshold;

10 determine whether a magnitude of the total timing drift is greater than a predefined drift threshold if the magnitude of the short-term frequency error is determined to be not greater than the predefined error threshold; and

adjust the frequency of the mobile communication device to reverse a drift direction of the total timing drift if the magnitude of the total timing drift is determined to be greater than the predefined drift threshold.

15 29. The mobile communication device according to claim 28, wherein the frequency control unit is further configured to keep the frequency of the mobile communication device the same if the magnitude of the total timing drift is determined to be not greater than the predefined drift threshold.

20 30. The mobile communication device according to claim 28, wherein the frequency control unit adjusts the frequency of the mobile communication device by

decreasing the reference frequency if a value of the total timing drift is determined to be not greater than the predefined drift threshold.

31. The mobile communication device according to claim 28, wherein the
5 frequency control unit adjusts the frequency of the mobile communication device by increasing the reference frequency if a value of the total timing drift is determined to be greater than the predefined drift threshold.

32. The mobile communication device according to claim 28, wherein the
10 frequency control unit is further configured to change the frequency of the mobile communication device if the magnitude of the short-term frequency error is determined to be greater than the predefined error threshold.

33. The mobile communication device according to claim 32, wherein the
15 frequency control unit changes the frequency of the mobile communication device by decreasing the reference frequency if a value of the short-term frequency error is determined to be not greater than the predefined error threshold.

34. The mobile communication device according to claim 32, wherein the
20 frequency control unit changes the frequency of the mobile communication device by increasing the reference frequency if a value of the short-term frequency error is determined to be greater than the predefined error threshold.

35. The mobile communication device according to claim 28, wherein the frequency control unit adjusts the frequency of the mobile communication device by decrementing or incrementing a voltage controlled oscillator by one resolution unit at a time.

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36. The mobile communication device according to claim 32, wherein the frequency control unit adjusts the frequency of the mobile communication device by decrementing or incrementing a voltage controlled oscillator by one resolution unit at a time.